

Jeffrey Nathan Johnson

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Education

University of California, Davis, CA

Ph.D. in Applied Science (September 2009, GPA: 3.90)

Dissertation title: "Simulating magnetized laboratory plasmas with smoothed particle hydrodynamics"

Advisor: Prof. Garry Rodrigue, Department of Applied Science

M.S. in Applied Science (June 2004)

University of California, San Diego, CA

B.S. in Physics (June, 1999)

Skills

- Strong background in numerical analysis and the solution of differential equations that arise in engineering/physics problems; characterization of formal accuracy, stability, convergence
- Training in physics and engineering-related domains (solid and fluid mechanics, electromagnetic fields/radiation, plasmas, statistical mechanics)
- Over 20 years of programming experience (C, C++, Python, Fortran 9x, Objective C, various other languages)
- Experience using software engineering in production environments (test-driven development, design patterns, modern programming practices)
- High-performance computing (distributed and shared memory computing with MPI, threads), particularly applied to tightly-coupled problems on various computing platforms
- A track record of applying open-source software to solve problems quickly
- Ability to communicate effectively in interdisciplinary settings and provide technical mentoring
- Experience writing scientific papers and clear technical documentation

Work Experience

Research Scientist (3/2013 – present)

Lawrence Berkeley National Laboratory (Berkeley, CA)

- Working on parallel simulation codes for subsurface flows and geomechanics
- Conducting research in computational geometry in areas of automated grid generation, high-order boundary resolution

Software Engineer (3/2012 – 3/2013)

Net Power and Light (San Francisco, CA)

- Developed and debugged low-level networking components (RPC, congestion simulation and control) for a network protocol
- Worked on the Together* family of iOS apps (application code and API)

Geological Project Scientist (11/2011 – 3/2012)

Lawrence Berkeley National Laboratory (Berkeley, CA)

- Worked on algorithms and software for parallel simulations for gas hydrates and other subsurface phenomena.
- Designed and began implementation of a set of libraries for assets shared between related hydrogeology applications (TOUGH).
- Provided computer science and software expertise for scientists in the Earth Science Division.

Postdoctoral Researcher (12/2009 – 11/2011)

Lawrence Berkeley National Laboratory (Berkeley, CA)

- Developed an algorithm and supporting models for simulating low temperature capillary discharges for the LOASIS Laboratory (<http://loasis.lbl.gov>). Implemented software in C++, driven by Python, to be used by physicists to study these discharges.
- Worked on design and implementation of high-order algorithms for solving partial differential equations
- Provided development support for Chombo, a parallel C++ AMR framework

Technical Scholar (9/2006 – 9/2009)

Lawrence Livermore National Laboratory (Livermore, CA)

- Extended and characterized a numerical algorithm to simulate the dynamics of strongly magnetized plasma with the equations of resistive magnetohydrodynamics.
- Developed an open source multidimensional software package for studying algorithms in plasma physics and electrodynamics.
- Collaborated with the Compact Toroid Injection Experiment at U.C. Davis (<http://ctix.das.ucdavis.edu>) to study magnetized plasmas.

Computer Scientist / Math Programmer (6/2000 – 2/2006)

Lawrence Livermore National Laboratory (Livermore, CA)

- Designed and implemented several major components for a parallel multi-physics inertial confinement fusion code (C++, Python)
- Ran and debugged parallel simulations on thousands of processors.
- Implemented and maintained a custom build system for the project.
- Introduced software engineering techniques to improve code reliability.
- Provided support and mentoring for other developers (25-person staff) and for users

Engineer (7/1999 – 6/2000)

ESSCOR, Inc. (Solana Beach, CA)

- Helped design a user interface for simulations of 1-D fluid/heat flows
- Wrote software to allow a user interface to communicate remotely with a computational engine
- Implemented logic to store initial conditions and simulation data in a database

Programmer / Technical Lead (9/1997 – 6/1999)

EarthKAM project (University of California, San Diego)

- Designed and implemented an object-oriented C++ framework to replace the project's aging C software base.
- Directed and mentored a group of 8 undergraduate programmers.
- Wrote C++/Perl interfaces to a DB/2 database in collaboration with scientists at the Jet Propulsion Laboratory
- See <http://www.earthkam.ucsd.edu> for more information on this project

Technical Advisor / Programmer (9/1996 – 9/1997)

Visualizing Earth project (University of California, San Diego)

- Provided software tools to assist teachers with the creation of more effective computer-oriented science curricula.
- Implemented a stereo image tool to project satellite photos onto digital elevation maps in collaboration with a group at the Jet Propulsion Laboratory.

Publications

N. D. Keen, G. Pau, J. Johnson, S. Finsterle, E. Sonnenthal, "A new library to improve TOUGH parallel development", *Proceedings of the TOUGH Symposium 2012*

J. Johnson, D. Q. Hwang, R. D. Horton, R. W. Evans, J. M. Owen, "Simulated and experimental compression of a compact toroid", *Applied Physics Letters* 95, 11501 (2009)

J. Johnson, J. M. Owen, "A Meshless Local Petrov-Galerkin Method for Magnetic Diffusion", *Computer Modeling in Engineering and Science* 22, 165 (2007)

Stephen J. Howard, D. Q. Hwang, R. D. Horton, R. W. Evans, S. J. Brockington, J. Johnson, "Method of reconstructing a moving pulse", *Journal of Instrumentation* 2, 1108(2007)

J. Johnson, P. F. Dubois, "Issue Tracking", *Computing in Science and Engineering* 5, 71 (2003)

Presentations and Posters

A Fourth-Order Cut-Cell Approach for Hyperbolic Conservation Laws

International Conference for Industrial and Applied Mathematics (Vancouver, British Columbia, 2011)

Modeling Laboratory Plasmas with Smoothed Particle Hydrodynamics

American Physical Society Division of Plasma Physics Conference (Dallas, TX, 2008)

A comparison of mesh-free methods for magnetic diffusion in moving conductors

Lawrence Scholar Symposium (Livermore, CA, 2008)

Toward a compatible mesh-free method for magnetic diffusion

US National Congress for Computational Mechanics (San Francisco, CA, 2007)

The common mesh interface: a framework for computational geometry
US National Congress for Computational Mechanics (Albuquerque, NM, 2003)

Awards and Honors

Lawrence Scholar (2007-2009)
Lawrence Livermore Student Employee Graduate Research Fellowship (2006)
Phi Beta Kappa Honor Society (1999)
U.C. Regents Scholar (1995-1999)
National Merit Scholar (1995-1999)
California Space Grant Scholarship (1997-1998)
McNair Scholar (1996-1997)
Roger Revelle Scholarship (1995)